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Chen et al.

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(54) **AUTOMATIC CLOSING STRUCTURE FOR SLATS OF SASH**

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E05F 11/04 (2006.01)
E06B 3/48 (2006.01)

(52) **U.S. Cl.**
CPC ***E06B 7/096*** (2013.01); ***E05F 11/04*** (2013.01); *E06B 3/481* (2013.01)

(58) **Field of Classification Search**
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USPC 49/82.1, 183, 73.1, 506, 81.1, 80.1, 74.1, 49/386, 379, 381, 86.1, 89.1, 163, 161; 52/473
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,701,669	B1 *	3/2004	Yorgason	E06B 7/096 49/82.1
7,434,353	B2 *	10/2008	Nien	E06B 7/086 49/403
9,038,314	B2 *	5/2015	Chen	E06B 7/096 49/82.1
2005/0252086	A1 *	11/2005	Yorgason	E06B 7/096 49/82.1
2005/0257429	A1 *	11/2005	Yorgason	E06B 7/096 49/82.1
2008/0178526	A1 *	7/2008	Browne	F24F 13/1426 49/82.1
2008/0250717	A1 *	10/2008	Vasquez	E06B 7/096 49/74.1
2009/0149123	A1 *	6/2009	Blagg	F24F 13/1426 454/258
2013/0118082	A1 *	5/2013	Colson	E06B 7/096 49/82.1

(Continued)

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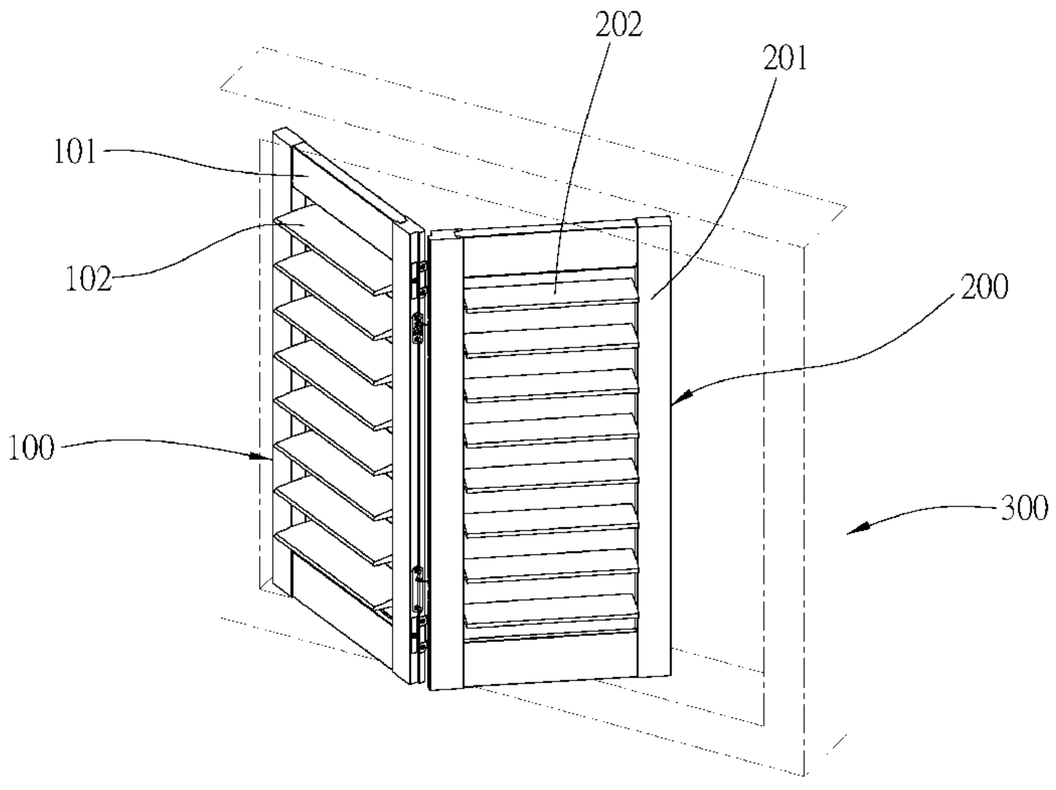
(57) **ABSTRACT**

An automatic closing structure is disclosed, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object; the sash includes a frame and a plurality of turnable slats which are arranged in parallel in the frame; the automatic closing structure has a cord which is adapted to automatically close the slats, wherein the cord can be easily assembled into the automatic closing structure, and a tightness thereof can be adjusted.

28 Claims, 14 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2014/0033610	A1*	2/2014	Watkins	E06B 7/086 49/82.1
2014/0166219	A1*	6/2014	Chen	E06B 9/266 160/368.1

* cited by examiner

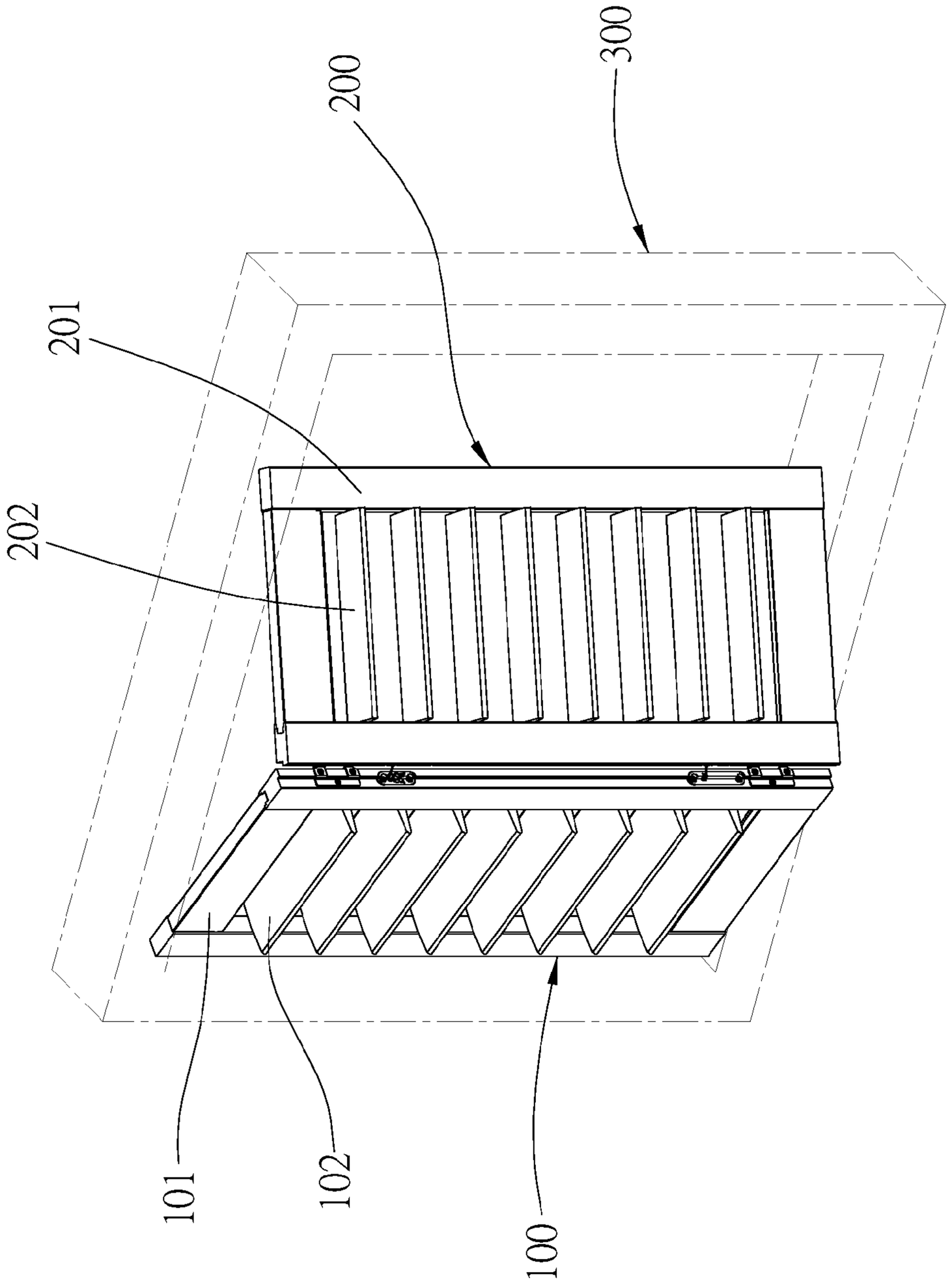


FIG. 1

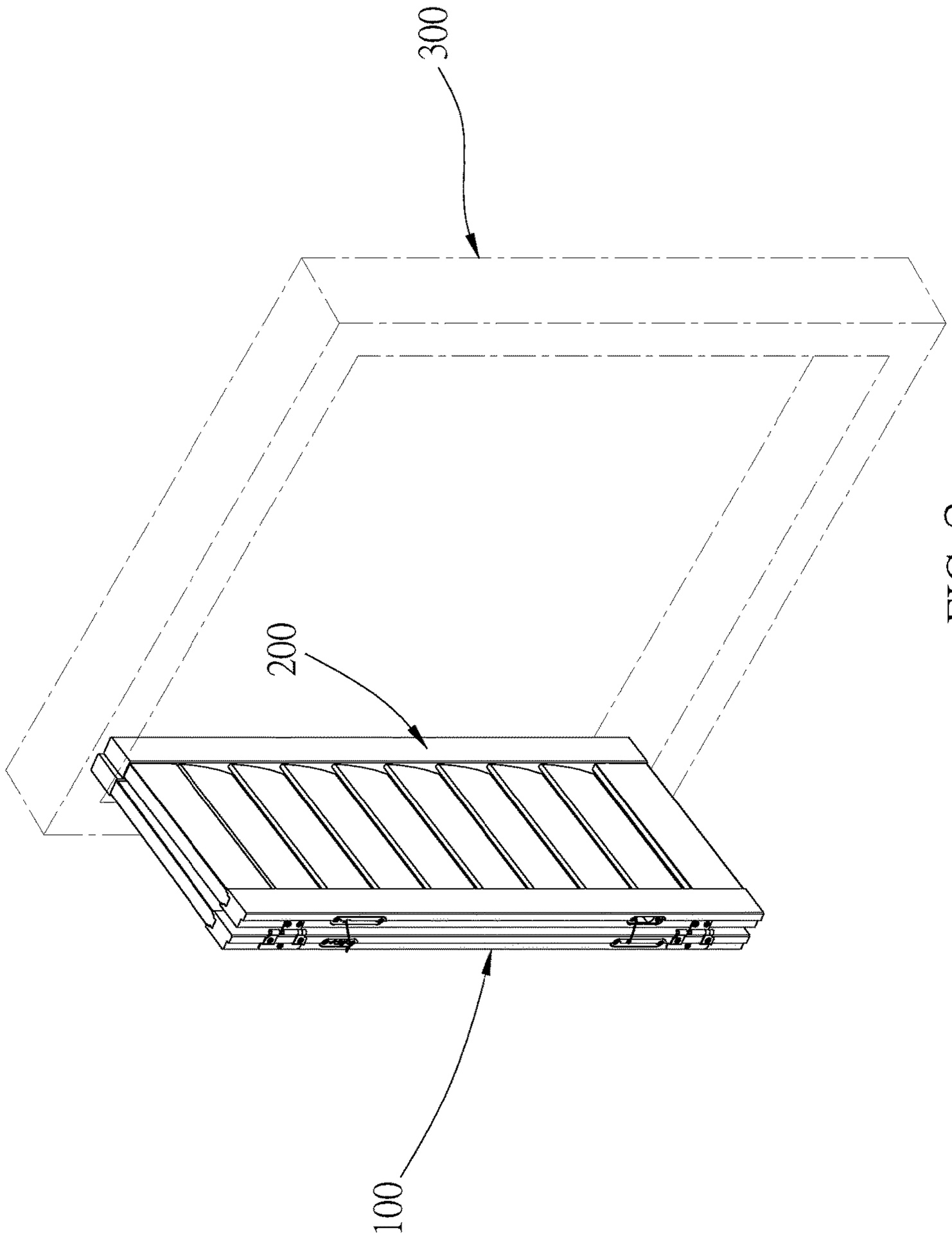


FIG. 2

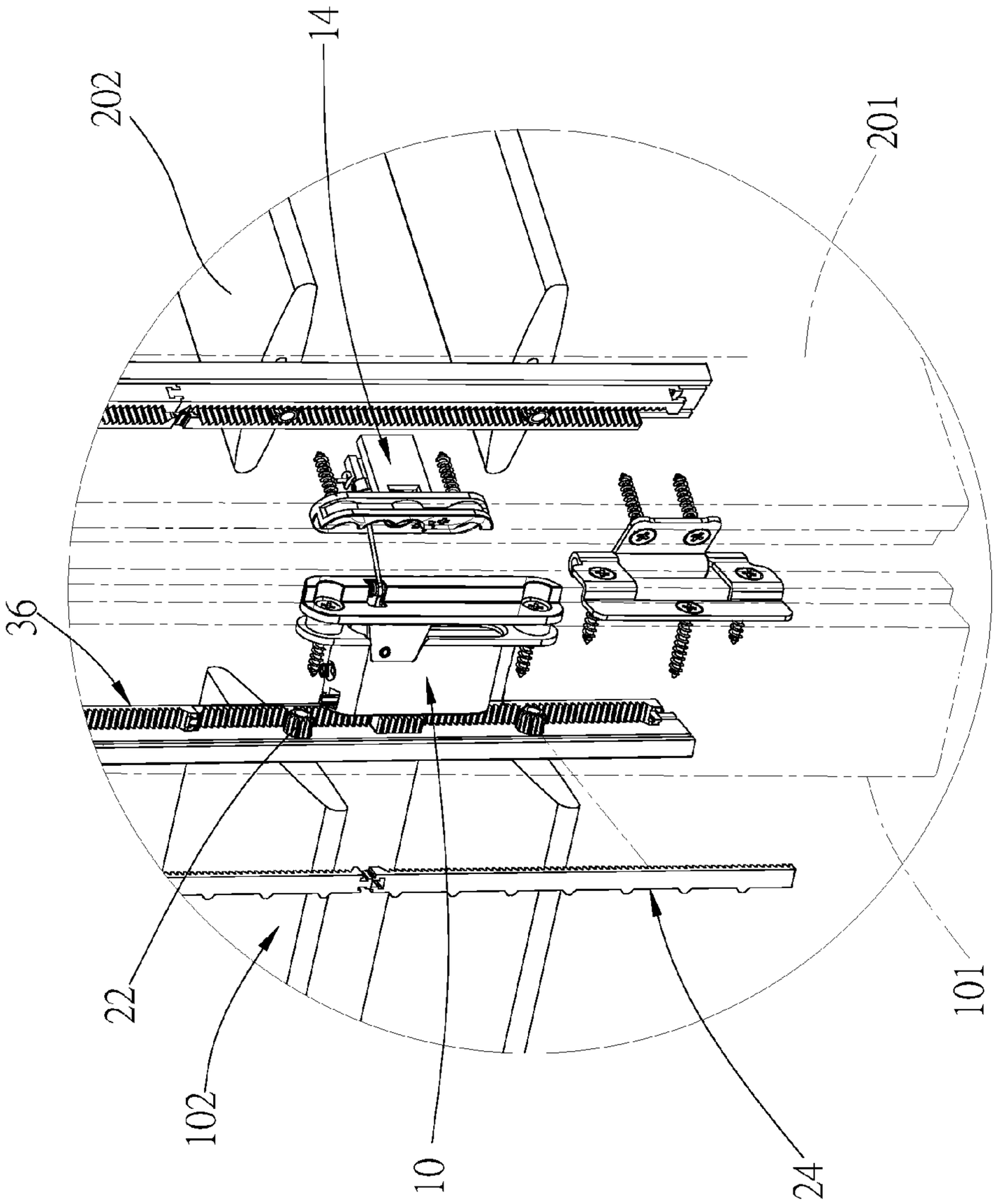


FIG. 3

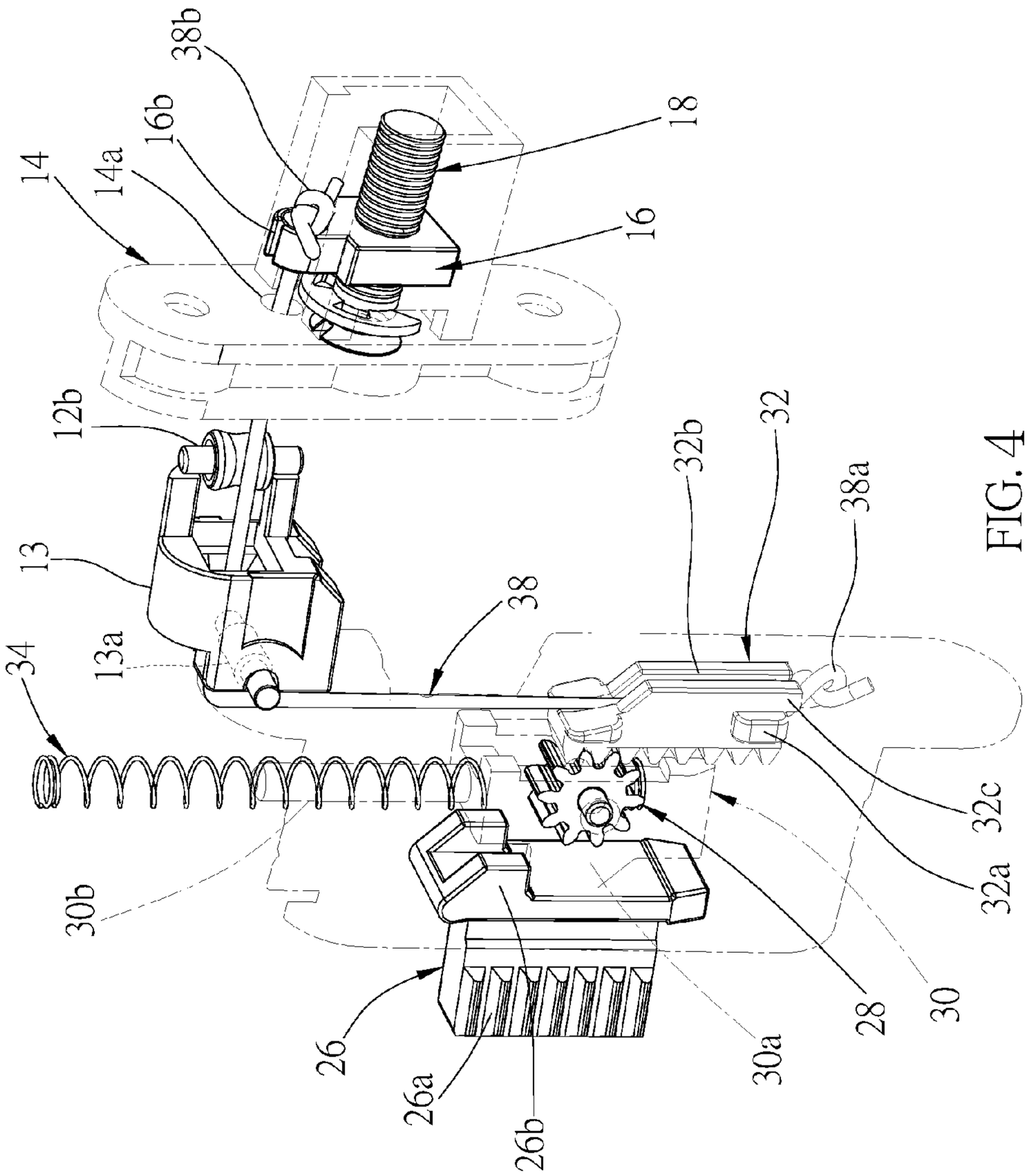
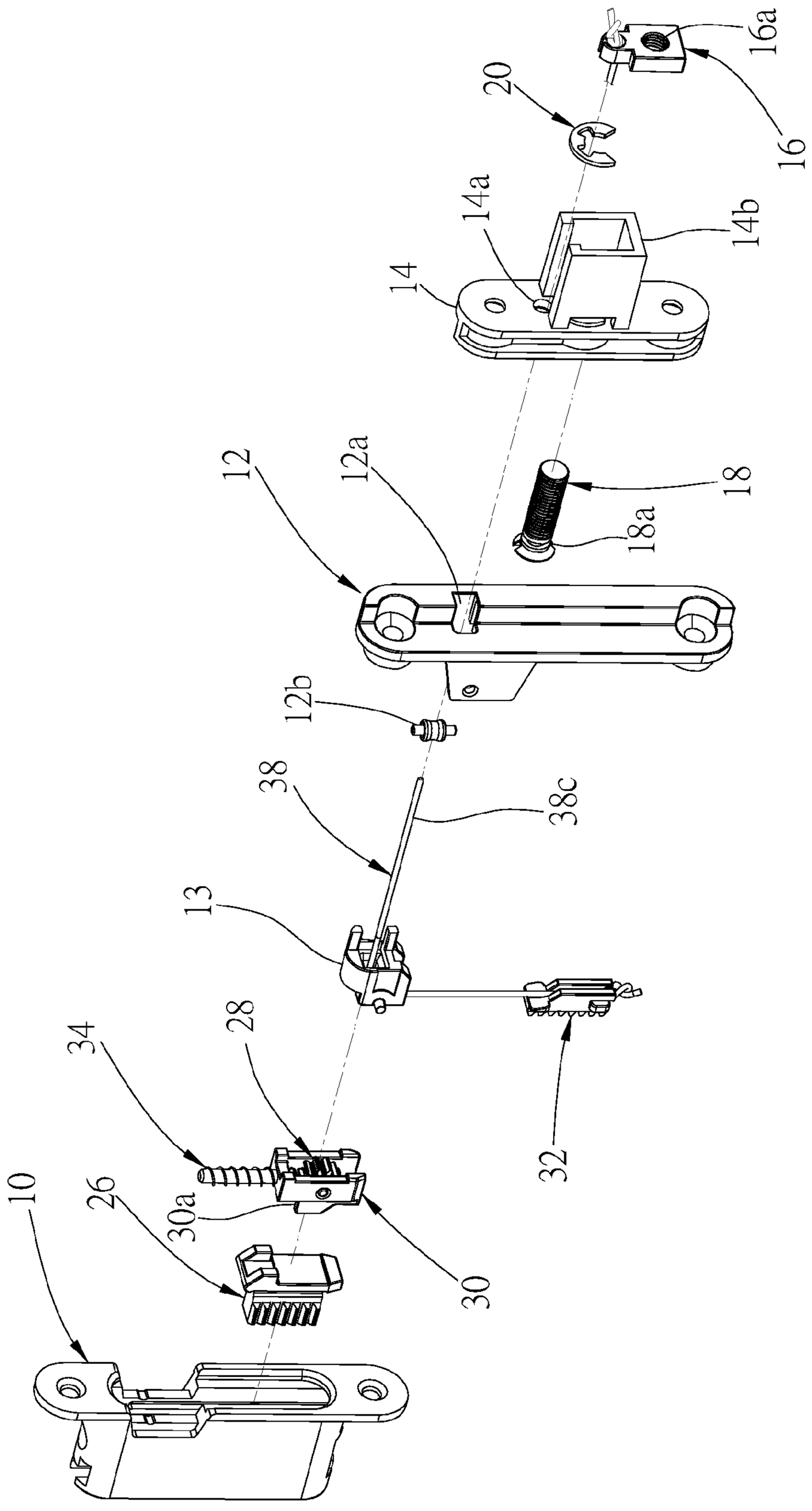

38b
18
16b
14
14a
16
12b
32b
32
38a
13
38
34
13a
32c
32a
30b
28
30
26
30a
26a
26b

FIG. 4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18a
12b
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38c
13
28
34
32
10
26
30a
30

FIG. 5

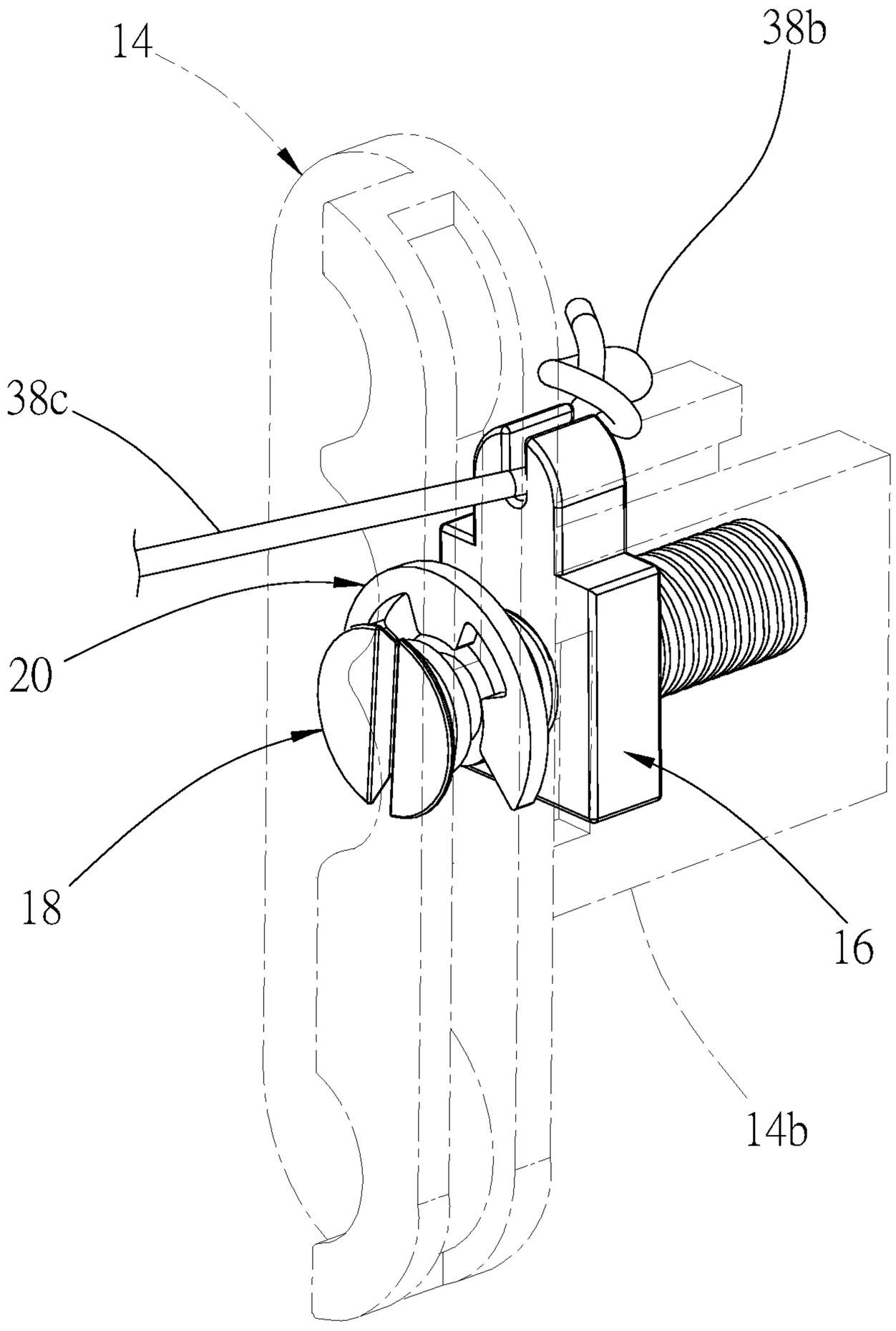

FIG. 6

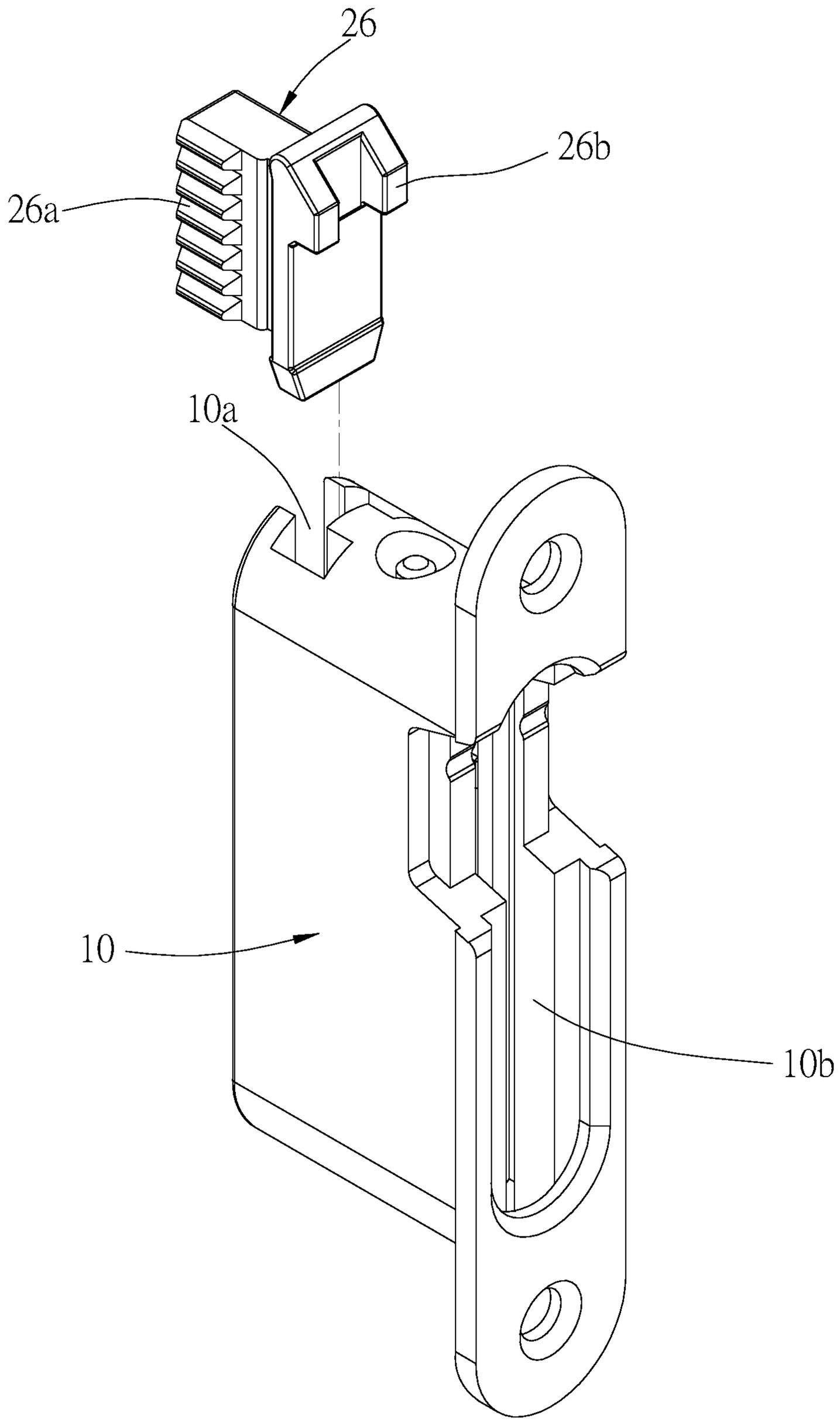

FIG. 7

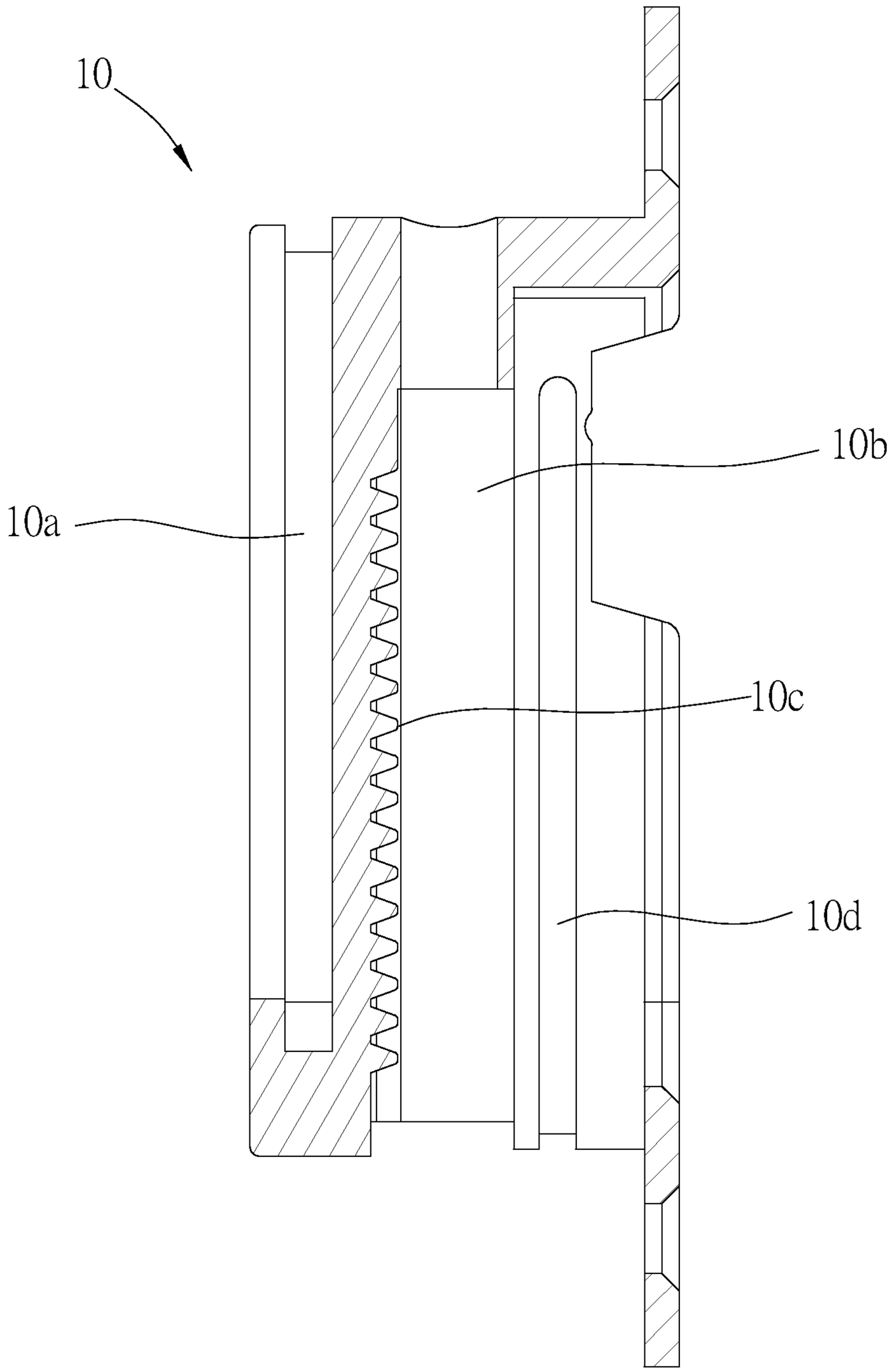

FIG. 8

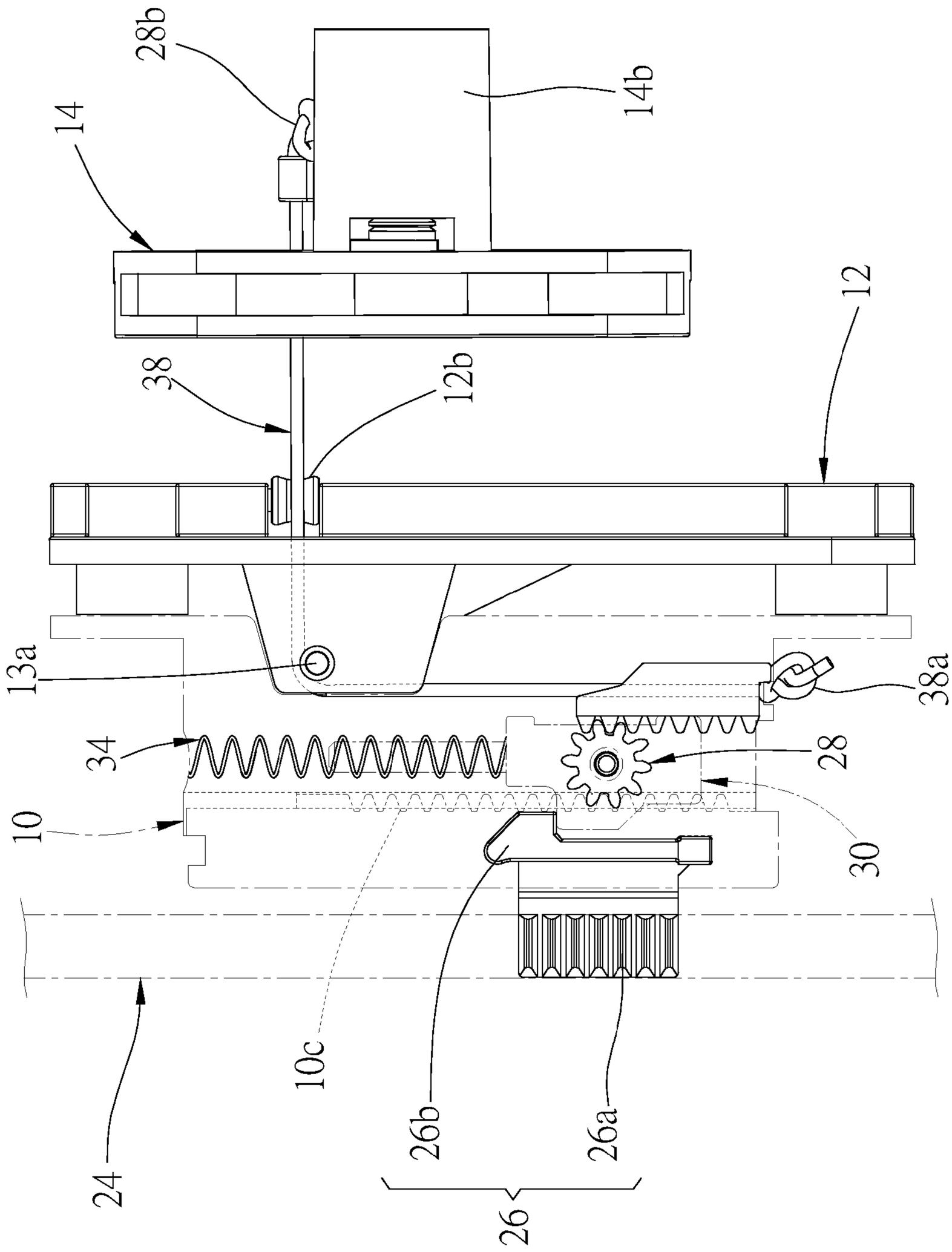

FIG. 9

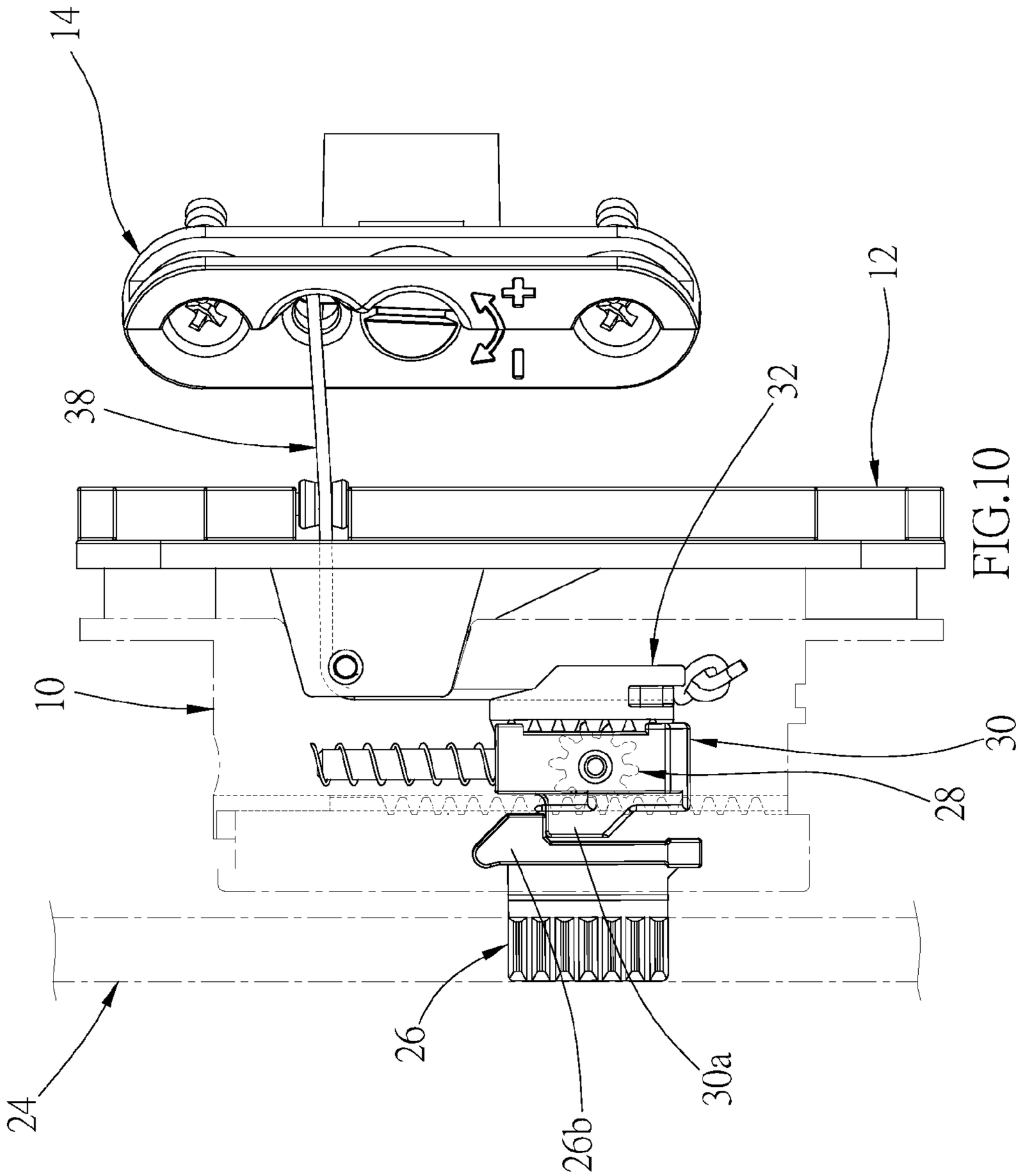

FIG.10

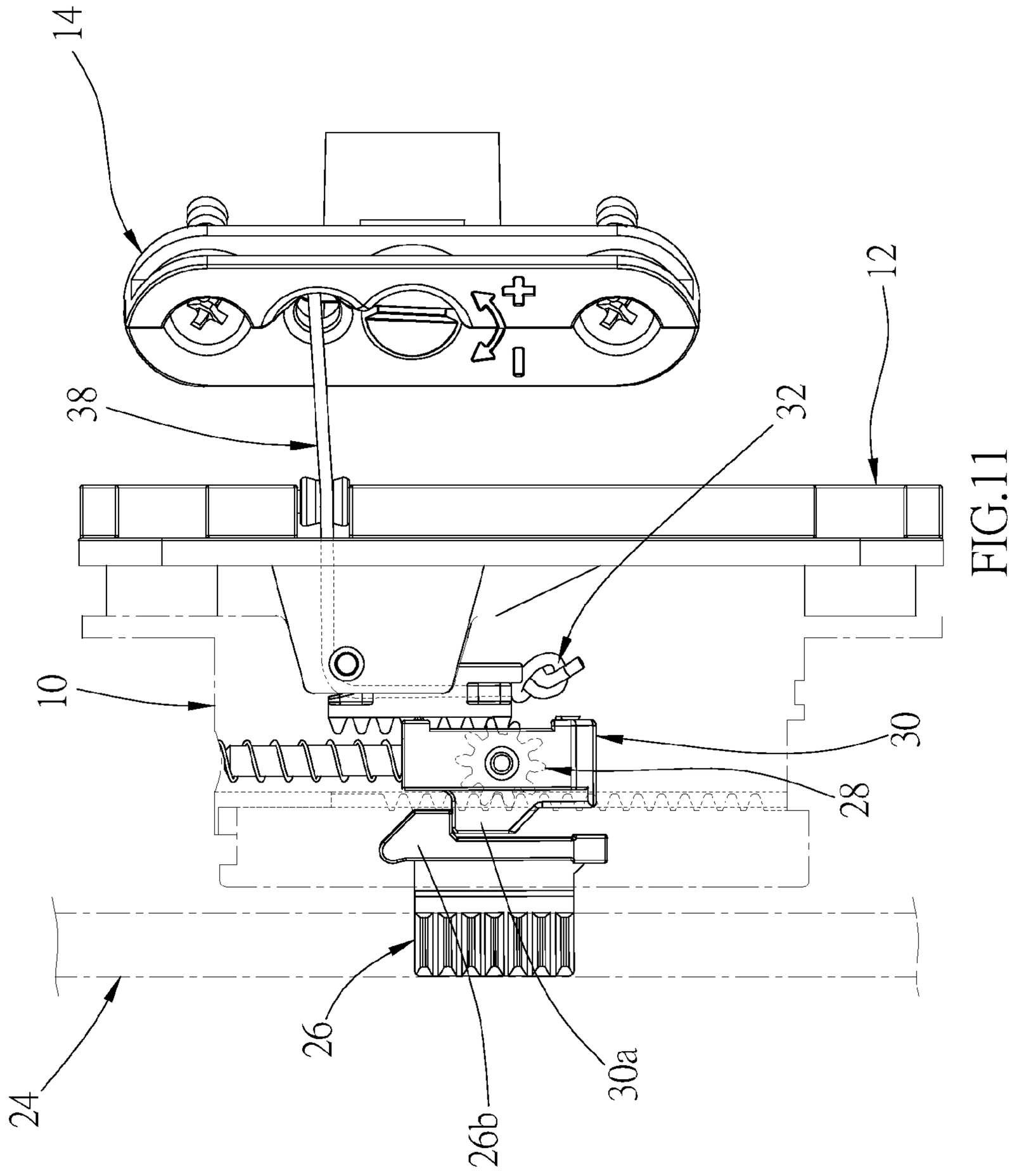

FIG.11

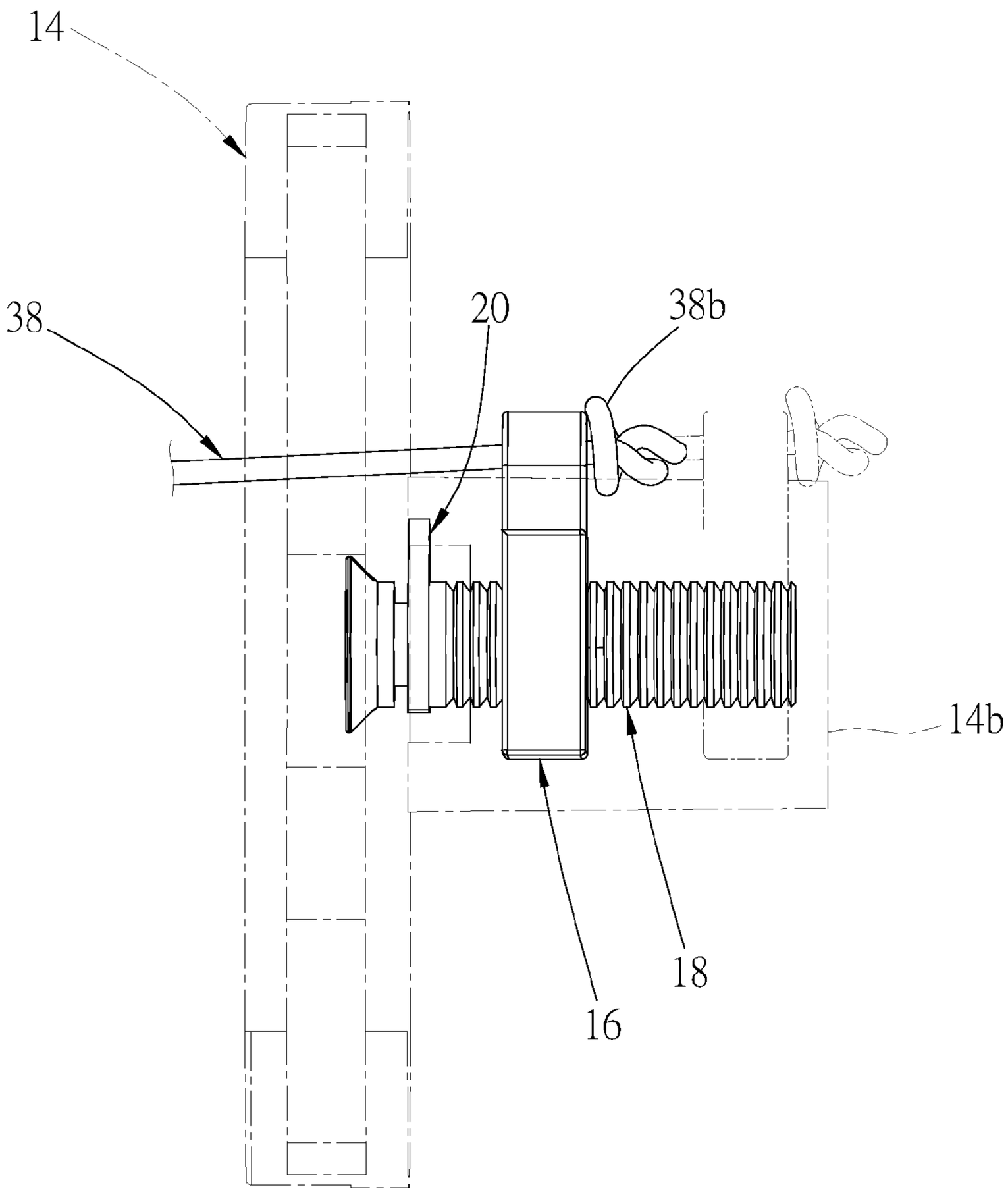

FIG.12

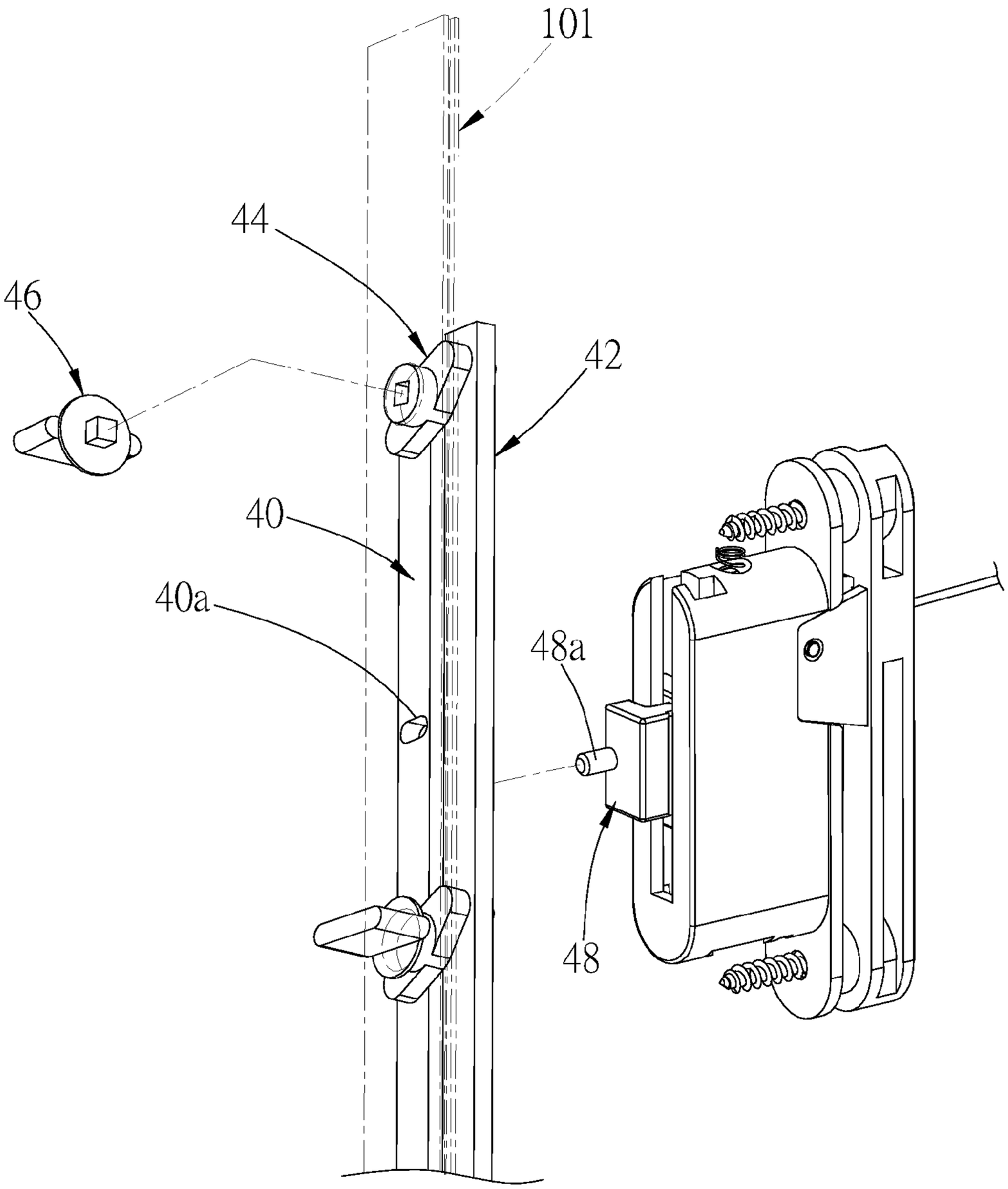

FIG.13

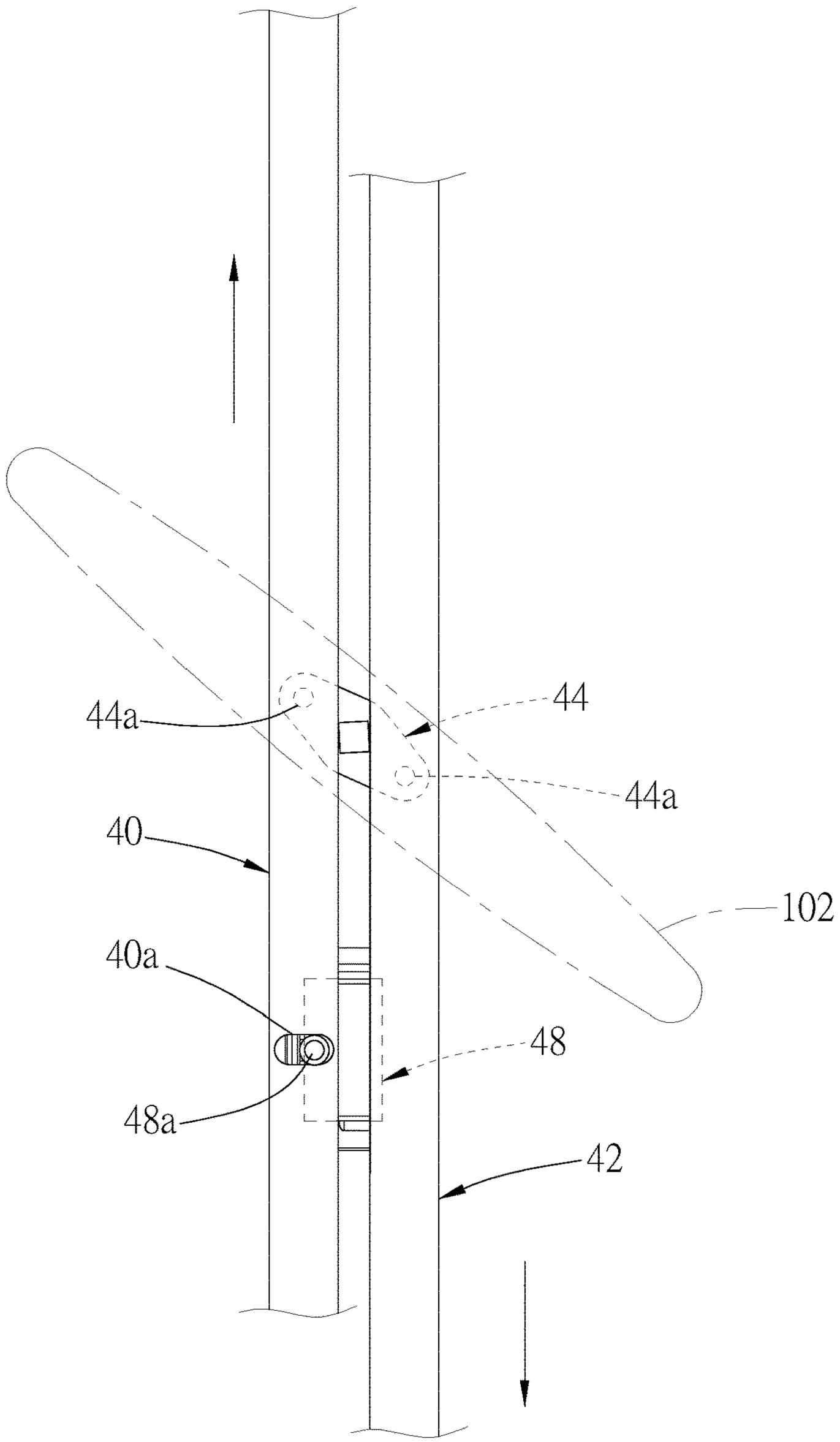

FIG.14

AUTOMATIC CLOSING STRUCTURE FOR SLATS OF SASH

The current application claims a foreign priority to application number 201520721707.1 filed on Sep. 17, 2015 in China.

BACKGROUND OF THE INVENTION

1. Technical Field

The present invention relates generally to a sash, and more particularly to an automatic closing structure for slats of the sash.

2. Description of Related Art

Typically, a sash is composed of a frame and a plurality of slats, which are horizontally arranged in the space surrounded by the frame, wherein the slats are pivotally connected to the frame, and are therefore turnable. By adjusting the angle of the slats between a horizontal direction and a vertical direction, the amount of light from outside and the degree of ventilation can be appropriately regulated.

In other to increase the amount of light from outside and the degree of ventilation, some sashes are designed to have the frame pivotally connected to a window frame of a building. In this way, the opening of the building where such a movable sash is installed can be fully opened by opening the sash completely, which facilitates light and air to enter the room. However, the edges of slats of this kind of movable sash tend to be damaged if the slats are adjusted to the horizontal direction while the sash is being opened toward a wall of the building, or while two sashes are being moved toward each other. Therefore, the conventional movable sashes still have room for improvement.

BRIEF SUMMARY OF THE INVENTION

In view of the above, the primary objective of the present invention is to provide an automatic closing structure, which is able to automatically close slats of a sash. Moreover, the cord included in the structure is easy to be installed, and the tightness of the cord is adjustable.

The present invention provides an automatic closing structure, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object, and the sash comprises a frame and a plurality of turnable slats which are arranged in parallel in the frame. The automatic closing structure includes a follower assembly, a linkage device, and a plurality of rotary members, wherein each of the rotary members is respectively provided at an end of each of the slats; the follower assembly is movably provided in the frame, and comprises a first linkage member to be engaged with the rotary members; the linkage device is adapted to move the follower assembly, which moves the rotary members relative to the first linkage member. The follower assembly comprises a second linkage member, which is controllable to move the first linkage member in a linear direction. The linkage device comprises a cord, which has a first stop portion, a second stop portion, and a cord portion located between the first stop portion and the second stop portion, wherein the first stop portion is connected to the second linkage member, and the second stop portion is connected to the corresponding object.

The present invention further provides an automatic closing structure, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object, and the sash comprises a frame and a plurality of turnable slats which are arranged in parallel in the frame. The automatic closing structure includes a follower assembly, a linkage device, and a plurality of rotary members, wherein each of the rotary members is respectively provided at an end of each of the slats; the follower assembly is movably provided in the frame, and comprises a first linkage member to be engaged with the rotary members; the linkage device is adapted to move the follower assembly, which moves the rotary members relative to the first linkage member. The automatic closing structure comprises a rack fixedly provided in the frame. The follower assembly comprises a gear, a movable block, and a second linkage member, wherein the gear is rotatably provided in the movable block, and meshes with the rack; the second linkage member has a flat teeth meshing with the gear at a side opposite to the rack; the second linkage member is controllable to move the movable block, and to consequently move the first linkage member in a linear direction.

The present invention further provides an automatic closing structure, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object, and the sash comprises a frame and a plurality of turnable slats which are arranged in parallel in the frame. The automatic closing structure includes a follower assembly, a linkage device, and a plurality of rotary members, wherein each of the rotary members is respectively provided at an end of each of the slats; the follower assembly is movably provided in the frame, and comprises a first linkage member to be engaged with the rotary members; the linkage device is adapted to move the follower assembly, which moves the rotary members relative to the first linkage member. The automatic closing structure comprises a locating seat and an adjusting member, wherein the locating seat is fixed on the corresponding object, and has a bore; the adjusting member has a mobile block movably provided on the locating seat. The linkage device comprises a cord passing through the bore of the locating seat; the cord has a first stop portion, a second stop portion, and a cord portion located between the first stop portion and the second stop portion, wherein the first stop portion is connected to the follower assembly, and the second stop portion is connected to the mobile block.

Whereby, the cord can be easily and conveniently installed or even replaced, and the movable block which is connected to the gear is moved over a shorter distance than the second linkage member being moved upward by the cord, which prevents the slats from being excessively closed, and makes the tightness of the cord adjustable.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The present invention will be best understood by referring to the following detailed description of some illustrative embodiments in conjunction with the accompanying drawings, in which

FIG. **1** is a perspective view, showing a building opening covering structure includes two sashes;

FIG. **2** is a perspective view, showing the sashes of the building opening covering structure are moved to be arranged in parallel with each other;

FIG. **3** is a perspective view, showing the relation between an automatic closing structure of a preferred embodiment of the present invention and the aforementioned sashes;

FIG. **4** is a perspective view, showing the automatic closing structure of the preferred embodiment of the present invention;

FIG. **5** is an exploded view, showing some components of the automatic closing structure of the preferred embodiment of the present invention;

FIG. **6** is a perspective view, showing the locating seat and the adjusting member of the automatic closing structure of the preferred embodiment of the present invention;

FIG. **7** is a perspective view, showing base and the follower block of the automatic closing structure of the preferred embodiment of the present invention;

FIG. **8** is a sectional view, showing inner structure of the base of the automatic closing structure of the preferred embodiment of the present invention;

FIG. **9** is a schematic view, showing the follower assembly of the automatic closing structure of the preferred embodiment of the present invention is located at the bottom of the base;

FIG. **10** is a schematic view, showing the follower assembly of the automatic closing structure of the preferred embodiment of the present invention is moved upward;

FIG. **11** is a schematic view, showing the follower assembly of the automatic closing structure of the preferred embodiment of the present invention is moved upward and approaching the top of the base;

FIG. **12** is a schematic view, showing the mobile block and screw rod of the adjusting member of the automatic closing structure of the preferred embodiment of the present invention;

FIG. **13** is a perspective view, showing some components of an automatic closing structure of an alternative preferred embodiment of the present invention; and

FIG. **14** is a schematic view, showing the follower assembly of the automatic closing structure of the aforementioned alternative preferred embodiment of the present invention is moved upward.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. **1** and FIG. **2**, a building opening covering structure includes a first sash **100** and a second sash **200** installed in a window frame **300**, wherein the first sash **100** is pivotally connected to the window frame **300** with a side thereof, and another side of the first sash **100** is pivotally connected to the second sash **200**, whereby the first sash **100** and the second sash **200** can block the opening of the building when expanded, and open the opening of the building when folded together (i.e., arranged in parallel with each other). The aforementioned first sash **100** and second sash **200** have the same structure, each of which includes a frame **101** (**201**) and a plurality of slats **102** (**202**), wherein the slats **102** (**202**) are horizontally arranged in the frame **101** (**201**), and are turnable to change the degree of coverage.

In a preferred embodiment, the present invention includes two automatic closing structures, which are installed between the aforementioned first sash **100** and second sash **200**, wherein one of the two automatic closing structures is used to automatically close the slats **102** of the first sash **100**, while the other automatic closing structure is used to automatically close the slats **202** of the second sash **200**. For purpose of illustration, herein we take the automatic closing structure applied for the first sash **100** as an example. In this case, the second sash **200** is deemed to be a corresponding object of the first sash **100**.

As shown in FIG. **3** to FIG. **8**, the automatic closing structure of the preferred embodiment includes a base **10**, a lateral lid **12**, a locating seat **14**, an adjusting member, a plurality of rotary members **22**, a follower assembly, and a linkage device.

The base **10** is embedded and fixed into the frame **101** of the first sash **100** through a lateral surface thereof. A side of the base **10** has a longitudinal guide rail **10***a*, and another side thereof has a trough **10***b* recessed from a side surface thereof. The guide rail **10***a* communicates with the trough **10***b*, wherein a bottom of the trough **10***b* is provided with a longitudinal rack **10***c*, which is fixed and unmovable, and each of two lateral walls of the trough **10***b* respectively has a longitudinal and recessed guideway **10***d*. The lateral lid **12** is fixedly connected to the base **10** to enclose the trough **10***b*, wherein the lateral lid **12** has a bore **12***a*; a direction changing wheel **12***b* and a direction changing block **13** are provided inside the lateral lid **12**; a direction changing wheel **13***a* is further provided inside the direction changing block **13**.

The locating seat **14** is embedded and fixed into the frame **201** of the second sash **200** through a lateral surface thereof. The locating seat **14** has a perforation (not shown) and a bore **14***a*, and further has a lead rail **14***b* on a rear surface thereof extending outwardly. The adjusting member includes a mobile block **16**, a screw rod **18**, and a C-shaped buckle **20**, wherein the mobile block **16** is movably disposed in the lead rail **14***b* of the locating seat **14**. The mobile block **16** has a threaded hole **16***a* and a positioning aperture **16***b*. The screw rod **18** is screwed into the threaded hole **16***a* of the mobile block **16** after passing through the perforation of the locating seat **14**. The screw rod **18** has an annular limiting groove **18***a* on a body portion thereof, wherein the limiting groove **18***a* is buckled by the C-shaped buckle **20** so that the screw rod **18** can only rotate in situ. In other words, by using a tool (e.g., a screw driver) to rotate the screw rod **18** clockwise or counterclockwise, the mobile block **16** can be moved forwardly or backwardly in the lead rail **14***b* of the locating seat **14** along the screw rod **18**.

The rotary members **22** are gears which are respectively provided at a side corresponding to the slats **102**. The follower assembly is movably disposed in the frame **101**, and includes a first linkage member **24**, a follower block **26**, a gear **28**, a movable block **30**, a second linkage member **32**, and a biasing member **34**. Except for the first linkage member **24**, which is disposed outside of the base **10**, and the follower block **26**, which is movably engaged within the guide rail **10***a* of the base **10**, the other components, i.e., the gear **28**, the movable block **30**, the second linkage member **32**, and the biasing member **34** are all received in the trough **10***b* of the base **10**.

As shown in FIG. **3**, the first linkage member **24** is a rack, and there is another fixed and unmovable rack **36** provided directly in front of teeth of the first linkage member **24**, wherein the first linkage member **24** and the rack **36** are parallel to each other, and the rotary members **22** mesh with the teeth of the first linkage member **24** and the rack **36** at the same time. In other words, the rotary members **22** can be rotated simultaneously to consequently turn the slats **102** by simply moving the first linkage member **24** upward or downward.

The follower block **26** of the follower assembly has a short rack **26***a* on a left side surface thereof, wherein the short rack **26***a* extends out of the base **10**, and is located

between the first linkage member **24** and the rack **36**. The short rack **26***a* meshes with the teeth of the first linkage member **24**. The follower block **26** has a first protrusion **26***b* on a right side thereof, wherein the first protrusion **26***b* extends into the trough **10***b*. The gear **28** is provided in the movable block **30**, and is rotatable therein, wherein the gear **28** meshes with the rack **10***c* inside the base **10**. The movable block **30** has a second protrusion **30***a* abutting against a bottom surface of the first protrusion **26***b*. As for the second linkage member **32**, it mainly meshes with the gear **28** through flat teeth **32***d* thereof, and is located at another side opposite to the rack **10***c* of the base **10**. The second linkage member **32** has two guide block **32***a*, each of which is respectively projected from one of two lateral walls thereof, wherein each of the guide blocks **32***a* is located in one of the guideways **10***d* of the base **10**. The second linkage member **32** further has a longitudinal slit **32***b*, and has an extended portion **32***c* at a bottom thereof. The biasing member **34** is a spring which fits around a post **30***b* on a top of the movable block **30**, wherein the biasing member **34** abuts against an inner wall of a top of the base **10** with an end thereof, and abuts against the top of the movable block **30** with another end thereof. Whereby, the biasing force is exerted on the movable block **30**, which not only keeps pushing the movable block **30** downwardly, but also helps to eliminate gaps formed between the rack **10***c*, the gear **28**, and the second linkage member **32**. As a result, the rack **10***c*, the gear **28**, and the second linkage member **32** can maintain a good contact relation between each other.

With the aforementioned design, when the movable block **30** is moved upward, the follower block **26** will be pushed upward as well. At this time, the follower block **26** further brings the first linkage member **24** together to rotate the rotary members **22**. The method of moving the movable block **30** upward is to move the second linkage member **32** upward along the guideway **10***d* of the base **10**, and by doing so, the second linkage member **32** drives the gear **28** to rotate upward along the fixed rack **10***c*. In other words, to turn the slats **102**, the second linkage member **32** has to eventually move the first linkage member **24** along a linear direction with the gear **28**, the movable block **30**, and the follower block **26** as intermediate components.

The linkage device is used to move the follower assembly, so that the rotary members **22** are moved relative to the first linkage member **24**. In the preferred embodiment, the linkage device includes a cord **38**, wherein two ends of the cord **38** are respectively a first stop portion **38***a* and a second stop portion **38***b*, which are both knots, wherein the cord **38** has a cord portion **38***c* between the first stop portion **38***a* and the second stop portion **38***b*. The cord portion **38***c* passes through the bore **12***a* of the lateral lid **12** and the bore **14***a* of the locating seat **14**, and runs around the direction changing wheel **12***b* and the direction changing wheel **13***a*, wherein a part of the cord portion **38***c* is further located in the positioning aperture **16***b* of the mobile block **16** and the slit **32***b* of the second linkage member **32**. The first stop portion **38***a* abuts against a bottom surface of the second linkage member **32**, and also abuts against the extended portion **32***c* through the guiding of the slit **32***b*, which prevents the cord **38** from being disengaged from the second linkage member **32**. Therefore, the first stop portion **38***a* is firmly connected to the follower assembly. As for the second stop portion **38***b*, it abuts against a rear surface of the mobile block **16** to prevent from disengaging. In other words, the second stop portion **38***b* is connected to the second sash **200** through the mobile block **16**.

Since a length of the cord portion **38***c* is fixed, when the first sash **100** and the second sash **200** are arranged side by side to close the opening of the building, and when the slats **102** (**202**) are arranged horizontally, the follower assembly is located at a bottom of the base **10** as shown in FIG. **9**. During the process of opening the opening of the building, the second linkage member **32** is pulled by the cord **38** and therefore moved upward, as illustrated in FIG. **10**. It can be understood from the above description that, the second linkage member **32** moves the first linkage member **24** to rotate the rotary members **22** with the gear **28**, the movable block **30**, and the follower block **26** as intermediate components; meanwhile, the slats **102** automatically and gradually close the opening of the building till the follower assembly is moved to be located near a top of the base **10**, as illustrated in FIG. **11**, wherein the slats **102** completely close the opening at this time.

Because there are two automatic closing structures included in the preferred embodiment, and these two automatic closing structures are installed in opposite ways, the slats of the first sash **100** and the second sash **200** are automatically turned from a horizontal direction to a vertical direction while these sashes **100**, **200** are being opened. In this way, the slats of each sash **100**, **200** won't collide with each other, and therefore the first sash **100** and the second sash **200** can be smoothly folded and arranged in parallel. Even if the sash is moved to against a wall, the vertically arranged slats won't collide with the wall, and therefore won't be damaged or cause harm to others.

In the above description, the opening of the building is covered by two sashes. However, in practice, there can be only one sash applied to cover the opening of the building. In the case of having only one sash, of course only one automatic closing structure is needed. In other words, the locating seat **14** and the adjusting member are installed in the window frame, and the components including the base **10**, the lateral lid **12**, and the follower assembly are provided inside the frame of the sash.

In the above description, the slit **32***b* of the second linkage member **32** has an open surface, and therefore while assembling the cord **38**, the cord portion **38***c* can be easily disposed in the slit **32***b*. Similarly, in order to quickly assembly the cord portion **38***c*, the positioning aperture **16***b* of the mobile block **16** can be alternatively designed to have an open lateral surface. With such design, the knots at two ends of the cord **38** can be used as means of preventing disengagement, which also improves the efficiency of assembling the components. In addition, if the cord **38** is required to be replaced, a user only needs to disassemble the lateral lid **12** and the locating seat **14**, then the cord **38** can be easily replaced, which is simple and convenient.

After the cord **38** is disposed in place, if it needs to be tightened or loosened, a user can rotate the screw rod **18** with a tool to move the mobile block **16** which is engaged with the cord **38** forward or backward, as shown in FIG. **12**, to tighten or to loosen the cord **38**. In the preferred embodiment, a top surface of the screw rod **18** has a single slot, which can be screwed with a flathead screwdriver.

It is worth mentioning that, because the rack **10***c* is fixed and unmovable, the gear **28** meshes with the rack **10***c*, and then the second linkage member **32** meshes with the gear **28** with the flat teeth **32***d* thereof, when the gear **28** is rotated and moved, the second linkage member **32** is moved outward relative to the gear **28**. With this clever design, the operation is efficient, because the moving distance of the movable block **30** is shorter than the upward moving distance of the second linkage member **32** while it is pulled by

the cord **38**. In addition, by precisely designing the moving distances of the second linkage member **32** and the movable block **30**, the rotary members **22** are prevented from being extensively rotated, which ensures the slats don't push each other too much.

As it can be seen from the above description, the cord **38** of the automatic closing structure provided in the present invention can be easily and conveniently assembled and even replaced. Furthermore, the tightness of the cord **38** can be adjusted to meet different requirements. In addition to these two advantages, the cleverly designed arrangement between the rack **10***c*, the gear **28**, and the second linkage member **32** helps to prevent the slats from being excessively closed, and therefore ensures the slats are not damaged by such cause.

In the aforementioned preferred embodiment, the slats can be turned through the gear (i.e., the rotary member **22**) provided at a side of each sash, wherein the gears can be rotated by moving the rack (i.e., the first linkage member **24**). However, in practice, there is an alternative way to turn the slats, and this alternative preferred embodiment is illustrated in FIG. **13** and FIG. **14**. The main difference is that, a first linkage member of the alternative preferred embodiment is a first long shaft **40** which has no teeth, and each of rotary members **44** is a block, which has a pivot **44***a* provided at and end thereof corresponding to the first long shaft **40**, wherein the pivot **44***a* is inserted into the first long shaft **40**. Each of the rotary members **44** is connected to a corresponding slat **102** through an external connector **46**. This alternative preferred embodiment has a special design: the rotary member **44** and the external connector **46** are disengagably connected to each other through a rectangular countersink and a rectangular post, whereby the external connector **46** can be moved by the rotary member **44** to rotate relative to the frame **101**. To better simultaneously rotate the rotary members, a second long shaft **42** can be further provided in practice as illustrated in FIG. **13** and FIG. **14**, which is parallel to the first long shaft **40**, and also has no teeth. Each of the rotary members **44** has two pivots **44***a* at two ends thereof, which respectively corresponds to the first long shaft **40** and the second long shaft **42**, wherein the pivots **44***a* are respectively inserted into the second long shaft **42** and the first long shaft **40**.

In addition, the follower block **48** has a rod **48***a* on a side thereof, wherein the rod **48***a* is inserted into a connecting hole **40***a* of the first long shaft **40**. Whereby, when the follower block **48** is moved due to the indirect control of the cord, the first long shaft **40** is moved upward or downward, and therefore the rotary members **44** are rotated. As a result, the external connectors **46** are also rotated to turn the slats **102**. It must be pointed out that the embodiments described above are only some preferred embodiments of the present invention. All equivalent structures which employ the concepts disclosed in this specification and the appended claims should fall within the scope of the present invention.

What is claimed is:

1. An automatic closing structure, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object, and the sash comprises a frame and a plurality of turnable slats which are arranged in parallel in the frame; comprising a follower assembly, a linkage device, and a plurality of rotary members, wherein each of the rotary members is respectively provided at an end of each of the slats; the follower assembly is movably provided in the frame, and comprises a first linkage member to be engaged with the rotary members; the linkage device is adapted to move the follower assembly, which moves the rotary members relative to the first linkage member; wherein:

the follower assembly comprises a second linkage member, which is controllable to move the first linkage member in a linear direction; and

the linkage device comprises a cord, which has a first stop portion, a second stop portion, and a cord portion located between the first stop portion and the second stop portion, wherein the first stop portion is connected to the second linkage member, and the second stop portion is connected to the corresponding object.

2. The automatic closing structure of claim **1**, wherein the second linkage member has a slit; a part of the cord portion which is near the first stop portion passes through the slit, so that the first stop portion is guided to abut against the second linkage member.

3. The automatic closing structure of claim **1**, further comprising a rack, which is fixedly provided in the frame, wherein the follower assembly comprises a gear and a movable block; the gear is rotatably provided in the movable block, and meshes with the rack; the second linkage member has a flat teeth meshing with the gear at a side opposite to the rack; the second linkage member is adapted to be pulled by the cord, which moves the movable block to consequently move the first linkage member.

4. The automatic closing structure of claim **3**, wherein the follower assembly comprises a follower block, which has a short rack meshing with teeth of the first linkage member; each of the rotary members comprises a gear meshing with the teeth of the first linkage member, so that the rotary member is adapted to be relatively moved by the first linkage member.

5. The automatic closing structure of claim **4**, wherein the follower block has a first protrusion, and the movable block has a second protrusion; the second protrusion abuts against a bottom surface of the first protrusion, so that the movable block is adapted to push the follower block upward, which consequently moves the first linkage member upward.

6. The automatic closing structure of claim **5**, further comprises a locating seat and an adjusting member, wherein the locating seat is fixed on the corresponding object, and the adjusting member has a mobile block movably provided on the locating seat; the locating seat has a perforation; and the mobile block of the adjusting member has a threaded hole; the adjusting member comprises a screw rod, which is screwed into the threaded hole of the mobile block through the perforation, wherein the screw rod is rotatable in situ, and the mobile block is movable on the locating seat along the screw rod.

7. The automatic closing structure of claim **3**, wherein the first linkage member of the follower assembly is a first long shaft; each of the rotary members has a pivot, which is respectively inserted into the first linkage member.

8. The automatic closing structure of claim **7**, wherein the follower assembly further comprises a follower block; the first linkage member has a connecting hole, and the follower block has a rod, which is inserted into the connecting hole, so that the first linkage member and the follower block are adapted to be moved together.

9. The automatic closing structure of claim **8**, wherein the follower block has a first protrusion, and the movable block has a second protrusion; the second protrusion abuts against a bottom surface of the first protrusion, so that the movable block is adapted to push the follower block upward, which consequently moves the first linkage member upward.

10. The automatic closing structure of claim 9, further comprises a locating seat and an adjusting member, wherein the locating seat is fixed on the corresponding object, and the adjusting member has a mobile block movably provided on the locating seat; the locating seat has a perforation; and the mobile block of the adjusting member has a threaded hole; the adjusting member comprises a screw rod, which is screwed into the threaded hole of the mobile block through the perforation, wherein the screw rod is rotatable in situ, and the mobile block is movable on the locating seat along the screw rod.

11. An automatic closing structure, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object, and the sash comprises a frame and a plurality of turnable slats which are arranged in parallel in the frame; comprising a follower assembly, a linkage device, and a plurality of rotary members, wherein each of the rotary members is respectively provided at an end of each of the slats; the follower assembly is movably provided in the frame, and comprises a first linkage member to be engaged with the rotary members; the linkage device is adapted to move the follower assembly, which moves the rotary members relative to the first linkage member; wherein:

the automatic closing structure comprises a rack fixedly provided in the frame; and

the follower assembly comprises a gear, a movable block, and a second linkage member, wherein the gear is rotatably provided in the movable block, and meshes with the rack; the second linkage member has a flat teeth meshing with the gear at a side opposite to the rack;

the second linkage member is controllable to move the movable block, and to consequently move the first linkage member in a linear direction.

12. The automatic closing structure of claim 11, wherein the follower assembly further comprises a follower block, which has a short rack meshing with teeth of the first linkage member; the rotary member comprises a gear meshing with the teeth of the first linkage member; the follower block has a first protrusion, and the movable block has a second protrusion; the second protrusion abuts against a bottom surface of the first protrusion, so that the movable block is adapted to push the follower block upward, which consequently moves the first linkage member upward.

13. The automatic closing structure of claim 12, wherein the linkage device comprises a cord, which has a first stop portion, a second stop portion, and a cord portion located between the first stop portion and the second stop portion, wherein the first stop portion is connected to the second linkage member, and the second stop portion is connected to the corresponding object.

14. The automatic closing structure of claim 13, further comprises a locating seat and an adjusting member, wherein the locating seat is fixed on the corresponding object, and the adjusting member has a mobile block movably provided on the locating seat; the locating seat has a perforation; and the mobile block of the adjusting member has a threaded hole; the adjusting member comprises a screw rod, which is screwed into the threaded hole of the mobile block through the perforation, wherein the screw rod is rotatable in situ, and the mobile block is movable on the locating seat along the screw rod.

15. The automatic closing structure of claim 13, wherein the second linkage member has a slit; a part of the cord portion which is near the first stop portion passes through the slit, so that the first stop portion is guided to abut against the second linkage member.

16. The automatic closing structure of claim 11, wherein the follower assembly further comprises a follower block; the first linkage member of the follower assembly is a first long shaft, each of the rotary members has a pivot, which is respectively inserted into the first linkage member; the follower block has a first protrusion, and the movable block has a second protrusion; the second protrusion abuts against a bottom surface of the first protrusion, so that the movable block is adapted to push the follower block upward, which consequently moves the first linkage member upward.

17. The automatic closing structure of claim 16, wherein the first linkage member has a connecting hole, and the follower block has a rod inserted into the connecting hole, so that the first linkage member and the follower block are adapted to be moved together.

18. The automatic closing structure of claim 16, wherein the linkage device comprises a cord, which has a first stop portion, a second stop portion, and a cord portion located between the first stop portion and the second stop portion, wherein the first stop portion is connected to the second linkage member, and the second stop portion is connected to the corresponding object.

19. The automatic closing structure of claim 18, further comprises a locating seat and an adjusting member, wherein the locating seat is fixed on the corresponding object, and the adjusting member has a mobile block movably provided on the locating seat; the locating seat has a perforation; and the mobile block of the adjusting member has a threaded hole; the adjusting member comprises a screw rod, which is screwed into the threaded hole of the mobile block through the perforation, wherein the screw rod is rotatable in situ, and the mobile block is movable on the locating seat along the screw rod.

20. The automatic closing structure of claim 18, wherein the second linkage member has a slit; a part of the cord portion which is near the first stop portion passes through the slit, so that the first stop portion is guided to abut against the second linkage member.

21. An automatic closing structure, which is installed between a sash and a corresponding object, wherein the sash is pivotable relative to the corresponding object, and the sash comprises a frame and a plurality of turnable slats which are arranged in parallel in the frame; comprising a follower assembly, a linkage device, and a plurality of rotary members, wherein each of the rotary members is respectively provided at an end of each of the slats; the follower assembly is movably provided in the frame, and comprises a first linkage member to be engaged with the rotary members; the linkage device is adapted to move the follower assembly, which moves the rotary members relative to the first linkage member; wherein:

the automatic closing structure comprises a locating seat and an adjusting member, wherein the locating seat is fixed on the corresponding object, and has a bore; the adjusting member has a mobile block movably provided on the locating seat; and

the linkage device comprises a cord passing through the bore of the locating seat; the cord has a first stop portion, a second stop portion, and a cord portion located between the first stop portion and the second stop portion, wherein the first stop portion is connected to the follower assembly, and the second stop portion is connected to the mobile block.

22. The automatic closing structure of claim 21, wherein the locating seat has a perforation; the mobile block of the adjusting member has a threaded hole, and the adjusting member comprises a screw rod, which is screwed into the threaded hole through the perforation, and is rotatable in situ.

23. The automatic closing structure of claim 21, wherein the follower assembly comprises a second linkage member, which is controllable to move the first linkage member in a linear direction.

24. The automatic closing structure of claim 23, wherein the second linkage member has a slit; a part of the cord portion which is near the first stop portion passes through the slit, so that the first stop portion is guided to abut against the second linkage member.

25. The automatic closing structure of claim 23, further comprising a rack, which is fixedly provided in the frame, wherein the follower assembly comprises a gear and a movable block; the gear is rotatably provided in the movable block, and meshes with the rack; the second linkage member has a flat teeth meshing with the gear at a side opposite to the rack; the second linkage member is adapted to be pulled by the cord, which moves the movable block to consequently move the first linkage member.

26. The automatic closing structure of claim 25, wherein the follower assembly comprises a follower block, which has a short rack meshing with teeth of the first linkage member; each of the rotary members comprises a gear meshing with the teeth of the first linkage member; the follower block has a first protrusion, and the movable block has a second protrusion; the second protrusion abuts against a bottom surface of the first protrusion, so that the movable block is adapted to push the follower block upward, which consequently moves the first linkage member upward.

27. The automatic closing structure of claim 25, wherein the follower assembly comprises a follower block; the first linkage member of the follower assembly is a first long shaft; each of the rotary members has a pivot, which is respectively inserted into the first linkage member; the follower block has a first protrusion, and the movable block has a second protrusion; the second protrusion abuts against a bottom surface of the first protrusion, so that the movable block is adapted to push the follower block upward, which consequently moves the first linkage member upward.

28. The automatic closing structure of claim 27, wherein the first linkage member has a connecting hole, and the follower block has a rod, which is inserted into the connecting hole, so that the first linkage member and the follower block are adapted to be moved together.

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